WORK PLAN

15-INCH AND 24-INCH PROPERTY LINE STORM PIPES CLEANUP WORK PLAN

STORMWATER SOURCE CONTROL IMPLEMENTATION LOWER DUWAMISH WATERWAY, SEATTLE, WASHINGTON

Prepared for

U.S. Environmental Protection Agency, Region 10

Prepared by

Anchor QEA, LLC, and

Floyd | Snider

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LOWER DUWAMISH WATERWAY, SEATTLE, WASHINGTON

Prepared for

Mike Sibley

U.S. Environmental Protection Agency, Region 10

Seattle, Washington

Prepared by

Anchor QEA, LLC

1423 Third Avenue

Seattle, Washington 98101

Floyd | Snider

601 Union Street, Suite 600

Seattle, Washington 98101

July 2010

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1 INTRODUCTION

This 15-inch and 24-inch Property Line Storm Pipes Cleanup Work Plan (Work Plan) details the cleanout and closure procedures proposed for the 24-inch and 15-inch[1] Property Line Storm Pipes (collectively, Pipes) located on Jorgensen Forge Corporation's Property at 8531 East Marginal Way South in Seattle, Washington (Jorgensen Property; Figure 1). The Work Plan has been collaboratively produced by Jorgensen Forge Corporation (Jorgensen) and The Boeing Company (Boeing) with assistance from their respective consultant teams.

Previous investigations conducted within the Pipes have documented the presence of elevated concentrations of polychlorinated biphenyls (PCBs) in solids within the Pipes. The U.S. Environmental Protection Agency (EPA) Office of Emergency Response has been designated as the lead agency for ensuring the PCBs within these Pipes are not a source of contamination to the adjacent Lower Duwamish Waterway (LDW). The remainder of this Work Plan details the scope of work to close the Pipes to eliminate the potential for discharges from these Pipes to the LDW and to remove solids currently residing in the Pipes.

1.1 Background

Following early settlement and the re-configuration of the LDW in the early 1900s, a "drainage ditch" existed near the current Property Line separating the currently existing Boeing Plant 2 Facility (Plant 2) property and the Jorgensen Property. Historical aerial photographs suggest that this drainage ditch was first used for agricultural drainage purposes up until the 1930s when it was likely used to drain a portion of the newly-constructed Boeing Field Airport. Development of the Plant 2 and Jorgensen properties that began in the mid 1940s led to the installation of the two Pipes:

- A subsurface 15-inch Property Line Storm Pipe (15-inch Pipe) that served as the stormwater outfall for a portion of the south side of Plant 2
- A subsurface 24-inch Property Line Storm Pipe (24-inch Pipe) that drained an additional portion of the south side of Plant 2, a portion of the Boeing Field Airport

1 The 15-inch Pipe is also referred to as the "12-inch pipe" in other documents that are quoted and referenced throughout this Work Plan.

(now known as King County International Airport [KCIA]), and a portion of the historic Bethlehem Steel Facility located on the Jorgensen Property.

In 1996 the City of Tukwila (City) began discharging stormwater runoff to the 24-inch Pipe that was captured from catch basins located along East Marginal Way South.

In 2001, a Boeing infrastructure project in the southwest corner of Plant 2 identified PCB impacted soil adjacent to and between the former Seattle City Light transformer substation and the fence line marking the boundary between the Plant 2 and Jorgensen properties. A phased environmental investigation was conducted by Boeing to define the nature and extent of PCB impacts. The *Phase 1 Transformer PCB Investigation Report* (Floyd Snider McCarthy, Inc. 2004) concluded that the stormwater conveyance system serving the transformer and wider area was a completed pathway for PCBs to the LDW sediments. Due to this completed pathway, Boeing conducted further soil sampling in the wider area and solids sampling from the nearby storm drainage systems including both Pipes. The results of this investigation were summarized in the *Phase 2 Transformer Investigation Report* (Floyd | Snider and Weston Solutions 2005), which showed elevated concentrations of PCBs in solids within both of the Pipes. It was concluded, however, that the PCBs discovered as a source in soil adjacent to the transformer substation had not migrated into either of the Pipes.

Active stormwater discharges to the 24-inch Pipe were occurring from the KCIA and City drainage areas during the 2005 investigation. At the time this Work Plan was developed, the KCIA discharges had been rerouted and the City was in the final stages of evaluating rerouting of their discharges. Plant 2 eliminated its discharges to both Pipes in approximately the mid-1990s. There is no documentation when the Bethlehem Steel Facility eliminated their discharges to the 24-inch Pipe, but the discharges are anticipated to have stopped in the mid-1960s when the Facility was dismantled.

On November 7, 2008, the Washington Department of Ecology (Ecology) issued a Notice of Violation (NOV; No. 6180) to King County (County) and the City for the discharge of stormwater through an area of known contamination (Ecology 2008) in the 24-inch Pipe. The County and the City jointly responded to the NOV, stating that they were not

responsible for any remedial action of the downgradient portion of the 24-inch Pipe located on the Jorgensen Property (King County and City of Tukwila 2008).

In 2010, Ecology transferred oversight of the 24-inch Pipe cleanup actions to the EPA Office of Emergency Response. Mike Sibley, who manages this cleanup on behalf of the EPA Office of Emergency Response, has approached Boeing and Jorgensen to perform the cleanup with the following objectives:

1. Eliminate stormwater discharges from the Pipes to the LDW.
2. Remove the solids and associated contamination from the Pipes.

Boeing and Jorgensen have jointly developed this Work Plan for submittal to EPA to document the procedures proposed to achieve these objectives and report on those activities once these objectives are achieved.

1.2 Work Plan Organization

The remainder of the Work Plan is organized into the following sections:

- Section 2 – Summary of Existing Information
- Section 3 – Scope of Work for Proposed Cleanout
- Section 4 – Completion Reporting
- Section 5 – Schedule
- Section 6 – Organizational Chart
- Section 7– References

2 SUMMARY OF EXISTING INFORMATION

The following sections provide a summary of the existing information that supports planning for the cleanup of the Pipes.

2.1 Summary of Nearby Investigations

Existing information on the Pipes was gathered primarily as part of other nearby investigations. The following subsections provide a summary of the nearby investigations.

2.1.1 Boeing – Phase 1 Transformer PCB Investigation Report

The information included in Sections 2.1.1.1 and 2.1.1.2 is drawn from the *Phase 1 Transformer PCB Investigation Report* (Floyd Snider McCarthy, Inc. 2004). Text excerpted directly from the report is included in quotes. Clarifications of the excerpts are included in brackets.

2.1.1.1 Introduction

"In mid 2001, Boeing informed EPA of Boeing's replacement of curbing on the southern portion of the Boeing Facility, including adjacent to an electrical substation with transformer equipment owned and operated by Seattle City Light (SCL). As part of the curbing replacement, soil samples from an excavation near the transformers were collected and submitted for laboratory analysis of polychlorinated biphenyls (PCBs). The results indicated high concentrations of PCBs. Based on these results, Boeing excavated an area measuring approximately 6 feet by 10 feet by 3 feet deep to remove contaminated soil and to further define the extent of PCBs (see Photo A.1, included in Appendix A of this Work Plan). Analyses of samples collected during August 2001 from the sidewalls and bottom of the excavation (termed the 'Area of Discovery') revealed PCB concentrations ranging from less than 37 µg/kg to 460,000 µg/kg."

2.1.1.2 Conceptual Site Model

"Historically, the primary pathway for a surface spill/leak in the transformer area (as evidenced by the Area of Discovery) is believed to be transported to the waterway through the [Plant 2 Facility] stormwater system."

2.1.1.3 Conclusion

The *Phase 1 Transformer Investigation Report* concluded that additional investigation was required to determine all current or historic pathways to the LDW including via the Pipes. The *Phase 2 Transformer PCB Work Plan* (Floyd | Snider and Weston Solutions 2004) was developed to fill these data gaps.

2.1.2 Boeing – Phase 2 Transformer PCB Investigation Report

The information included in Sections 2.1.2.1 and 2.1.2.2 is drawn from the *Phase 2 Transformer PCB Investigation Report* (Floyd | Snider and Weston Solutions 2005). Text excerpted directly from the report is included in quotes. Clarifications of the excerpts are included in brackets.

Figure 3.7 of the *Phase 2 Transformer PCB Investigation Report* (referenced in the following subsections) is included in Appendix A of this Work Plan.

2.1.2.1 Storm System Survey

"The purpose of the storm system survey was to determine the alignment and condition of existing pipes and to identify any unknown connecting pipes. Prior to the Phase 2 survey, the alignment, integrity, and connections of various components of the [Plant 2 Facility] storm system [serving the vicinity of the Area of Discovery] could not be firmly established. Therefore, the potential existed for PCBs in soil or groundwater to enter the [Plant 2 Facility] storm system through cracks and joints and become redistributed within the solids of the system, thereby making these pipes a possible active pathway for the migration of PCBs from the substation area to the waterway…

"…The two other major storm systems of interest both lie outside of Plant 2, on the Jorgensen Forge Property and consist of a 12-inch ID storm pipe that formerly drained Plant 2 and a 24-inch storm pipe that drains King County International Airport (KCIA) and

formerly drained a portion of Plant 2. These are referred to as the two parallel 'Property Line Storm Pipes.'" [2]

2.1.2.2 Storm Survey and Solids Sampling Results

"The results of the storm survey within the Transformer Investigation Area are shown in Figure 3.7. Significant findings from the survey within the Transformer Investigation Area are as follows:

- "Each storm system was found to be intact (upon review of the video) and have integrity (i.e., no broken, severely cracked, or missing sections of pipe were found) except for both Property Line Storm Pipes at a point just prior to their outfalls where a significant separation of the corrugated metal pipe was observed that prevented further survey.
- "No cross connection between these three systems and/or the substation area was found.
- "For the 24-inch Property Line Storm Pipe originating at KCIA, the following observations were made for that section transiting the Transformer Investigation Area (refer to Figure 3.7):
  - One manhole along the 24-inch pipe was discovered (designated SDMH 24A) having been obscured by gravel.
  - A 12-inch diameter pipe coming in from the Jorgensen Forge was discovered approximately 12 feet upgradient of SDMH 24A …

- "…For the 12-inch Property Line Storm Pipe, the following observations were made for that section transiting the Transformer Investigation Area:
  - PCB concentrations in the solids within SDMH 15A located approximately 50 feet east of the Area of Discovery contain elevated levels of PCBs (350,000 µg/kg)…

2 For clarification, the "12-inch ID Storm Pipe" referred to in this excerpt is called the 15-inch Pipe throughout this Work Plan.

- "…For those sections of both Property Line Storm Pipes that lie upgradient of the Transformer Investigation Area, the following observations were noted (and reported here for broader source control purposes):
  - A second manhole, designated 24B, was discovered along the 24-inch Property Line Storm Pipe, approximately midway between East Marginal Way and the Duwamish Waterway.
  - The 15-inch concrete pipe originating on Plant 2 that is shown connecting to the 24-inch pipe via SDMH 37-7 as portrayed in construction drawings was verified to exist and verified to be inactive.
  - Two heretofore unknown pipes (12-inch and 6-inch) were noted leading into the "Public" SDMH near East Marginal Way and appear to be inactive.
  - The 12-inch Property Line Storm Pipe system[3] was verified to originate entirely within Plant 2, and verified to be inactive.
  - The concentration of PCBs in the storm solids at the base of all manholes along these two piping systems are elevated (all sample results are greater than 100,000 µg/kg)."

2.1.2.3 24-inch Pipe Construction

No as-built drawings have been identified for the construction of the 24-inch Pipe, so this information was collected during completion of the *Phase 2 Transformer PCB Investigation Report* (Floyd | Snider and Weston Solutions 2005). The 24-inch Pipe is constructed of 24-inch concrete and 24-inch Corrugated Metal Pipe (CMP). The CMP portion of the pipe extends from the outfall approximately 70 lineal feet to the west on the Jorgensen Property and transitions to the 24-inch concrete pipe without a connecting structure. A 12-inch clay lateral enters the 24-inch concrete portion from the Jorgensen Property, and a 15-inch concrete lateral enters the concrete portion from Plant 2 further upgradient to the east. These are the only lateral connections to the trunk Pipe on the Jorgensen Property (Floyd | Snider and Weston Solutions 2005). The total length of the 24-inch concrete portion of the

3 For clarification, the "12-inch Property Line Storm Pipe" referred to in this excerpt is called the 15-inch Pipe throughout this Work Plan.

Pipe is approximately 1330 lineal feet. The locations of the CMP sections, concrete sections, and the lateral lines are shown in Figure 2.

2.1.3 15-inch Pipe Construction

No as-built drawings have been identified for the construction of the 15-inch Pipe, so this information was collected during completion of the *Phase 2 Transformer PCB Investigation Report* (Floyd | Snider and Weston Solutions 2005). The 15-inch Pipe is constructed of 15-inch concrete and 15-inch CMP. The CMP portion of the pipe extends from the outfall approximately 70 lineal feet to the west on the Jorgensen Property and transitions to the 15-inch concrete pipe without a connecting structure. At SDMH 15A, the 15-inch concrete pipe angles northeast onto the Plant 2 Property (Figure 3). The total length of the 15-inch concrete portion is approximately 680 lineal feet. The locations of the CMP and concrete sections and the orientation of the pipe are shown on Figure 2.

2.1.4 Farallon – Storm Drain Line Data Summary

Following completion of the *Phase 2 Transformer Investigation Work Plan (*Floyd | Snider and Weston Solutions 2004) activities, Farallon Consulting, LLC (Farallon), on behalf of Jorgensen, conducted sampling to characterize the PCB concentrations in solids residing within the historical 12-inch lateral connection (assumed to have served the Bethlehem Steel Facility located on the Jorgensen Property) to the 24-inch Pipe. A sample was collected from within the 12-inch lateral, just upgradient from the connection to the 24-inch Pipe and just downgradient from a piece of dimensional lumber—located approximately 40 feet upgradient of the connection—that was identified in the lateral during the video reconnaissance survey conducted during completion of the *Phase 2 Transformer Report* (Floyd | Snider and Weston Solutions 2005) activities.

The results of this additional characterization were summarized in a technical memorandum titled "Storm Drain Line Data Summary" (Farallon 2005). The memorandum reported that "concentrations of total PCBs detected in the samples collected by Farallon from the 12-inch line ranged from 1,100 mg/kg collected approximately 6 inches from the connection from the 24-inch line to 6.5 mg/kg collected approximately 40 feet from the connection with the 24-inch line."

Farallon obtained the furthest upgradient soil samples from within the 12-inch lateral by completing a single boring that broke through the lateral. Following the sample collection, the downgradient boring hole was filled with controlled density fill (CDF), thereby plugging the 12-inch lateral at the sampling location.

2.1.5 Tukwila – PCB Source Control Investigation of the City of Tukwila Stormwater System

In response to the Ecology's NOV (No. 6180), the City collected a single solid sample and water sample from the "Public" storm drain manhole (SDMH, Public SDMH 11/SD006/CB 4.005) near East Marginal Way South, located just east of the Jorgensen fence line, in 2008. The results were summarized in the *PCB Source Control Investigation of Tukwila Storm System* (PBS 2008). The solid and water samples had a PCB concentration of 100 milligrams per kilogram dry weight (mg/kg dw) and 22 micrograms per liter (µg/L), respectively.

2.1.6 Jorgensen – 12-inch Lateral Connection Investigation

As detailed in subsection 2.1.4, Farallon previously conducted a video reconnaissance survey within the 12-inch lateral; this survey extended just upgradient from the connection to the 24-inch Pipe to a piece of dimensional lumber located approximately 40 feet upgradient of the connection. In May 2010, Anchor QEA conducted an additional investigation within the 12-inch lateral to delineate the drainage and potential presence of solids within the area of the lateral upgradient of the piece of dimensional lumber. Soil was excavated to expose the portion of the 12-inch lateral just upgradient of the dimensional lumber, and the clay pipe was broken to facilitate upgradient video reconnaissance. The video reconnaissance confirmed that the 12-inch lateral extended approximately 35 feet upgradient of the dimensional lumber, where the pipe terminated. No lateral connections were identified in the 12-inch lateral within this short distance.

An additional soil excavation was conducted to provide access to the termination point identified by the video reconnaissance to facilitate further evaluation of the nature of the termination point (that is, pipe collapse versus end of pipe) and to determine if a solids sample could be collected in the pipe at the termination point. Once accessed, additional excavation was conducted upgradient of the termination point for several feet and no pipe

was identified indicating the termination point was the end of pipe. A single solids sample was collected from within the pipe at the termination point and submitted for PCB analysis. The results are pending validation and will be reported under a separate cover.

2.2 Nature and Extent of Chemical Concentrations

The following subsections provide a summary of the nature and extent of chemical concentrations identified within the concrete portions of the Pipes as reported in "Storm Drain Line Data Summary" (Farallon 2005) and *PCB Source Control Investigation of Tukwila Storm System* (PBS 2008).

2.2.1 24-inch Pipe

Five solids samples were collected and analyzed from the concrete portion of the 24-inch Pipe and lateral connections on the Jorgensen Property. PCB Aroclor® 1254 was detected in all solids samples in the 24-inch Pipe samples ranging from 68 milligrams per kilogram dry weight (mg/kg dw) in the most up-gradient manhole SD006 to 10,000 mg/kg dw in the most down gradient location SD005 (Figure 2). A 12-inch clay lateral (from Bethlehem Steel) and 15-inch concrete lateral pipe (from Plant 2) connect to the 24-inch Pipe with sample concentrations of 6.5 mg/kg dw and 730 mg/kg dw respectively. The sample results are presented in Table 1.

Table 1

Summary of 24-Inch Outfall Drainage Structures and Identified PCB Concentrations

Location/Sample	Sampling Location Characteristics	Sample Date	Sample Collected By:	Total PCBs (mg/kg dw)
SDMH 24A/SD005	24-inch diameter concrete	5/3/2005	Boeing/ Weston Solutions	**10,000**
12-SD-070105-01	12-inch diameter clay	7/1/2005	Jorgensen/Farallon	**1,100**
12-SD-070105-02	12-inch diameter clay	7/1/2005	Jorgensen/Farallon	**6.5**
SDMH 24B/SD004	24-inch diameter concrete	5/3/2005	Boeing/ Weston Solutions	**2,400**
MH 37-7/SD002	24-inch diameter concrete	5/3/2005	Boeing/ Weston Solutions	**730**
MH 37-2/SD001	24-inch diameter concrete	5/2/2005	Boeing/ Weston Solutions	**2,600**
"Public" SDMH 11/SD006/CB 4.0005	24-inch diameter concrete	6/3/2005	Boeing/ Weston Solutions	**68**
	24-inch diameter concrete	10/2/2008	City / PBS Engineering and Environmental (PBS)	**100**

Notes:

bold	Detected Concentration
mg/kg dw	milligrams per kilogram dry weight
µg/L	micrograms per liter

2.2.2 15-inch Pipe

Two solids samples were collected and analyzed from the concrete portion of the 15-inch Pipe. The sample from SDMH 15A was taken in two intervals (top 9 and bottom 3 inches of solids) and run discretely and as a composite. The SDMH 15A sample top 9 inch, bottom 3 inch and composite sample resulted in concentrations of 7.2, 350 and 79 mg/kg dw, respectively, consisting primarily of PCB Aroclors ® 1248 and 1254 with a trace amount of 1260. A single discrete solid sample collected from SD003 resulted in 140 mg/kg dw of PCB Aroclor ® 1254. Additional waste profiling for metals and SVOCs was conducted by Boeing on the material in the base of MH15A within the 15-inch line. The results did not indicate detections of these chemicals. Tables containing the results of the waste profiling (Table F.1 and F.2 from the *Phase 2 Transformer PCB Investigation Report* [Floyd | Snider and Weston Solutions 2005]) are contained in Appendix A. The results of 15-inch Pipe samples are summarized in Table 2.

Table 2
Summary of 15-Inch Outfall Drainage Structures and Identified PCB Concentrations

Location/ Sample	Sampling Location Characteristics	Sample Date	Sample Collected By	Total PCBs (mg/kg dw)
SDMH 15A	CB10 (Composite)	4/8/2005	Boeing/Weston	**79**
	CB011 (Top 9 inches)	4/8/2005	Boeing/Weston	**7.2**
	CB012 (Bottom 3 inches)	4/8/2005	Boeing/Weston	**350**
SDMH 15B	SD003	5/3/2005	Boeing/Weston	**140**

Notes:
bold Detected Concentration
mg/kg dw milligrams per kilogram dry weight

3 SCOPE OF WORK FOR PROPOSED CLEANOUT

This section provides the scope of work to close the Pipes to eliminate discharges from these Pipes to the LDW and to remove solids currently residing in the Pipes.

3.1 Phase 1 – Concrete Portion

Phase 1 will address the closure and cleanout of the concrete portion of the Pipes. The Pipes will be permanently closed and plugged at the downgradient intersection between the CMP and concrete portions. The 24-inch Pipe will be plugged in the upgradient location at approximately the eastern boundary of the Jorgensen Property, accessed through the "Public" manhole located just east of the Jorgensen Property fence line. The 15-inch Pipe was plugged in the upgradient location by Boeing in the mid-1990s..

The full extents of the concrete portions of the Pipes will be cleaned between the downgradient and upgradient closure locations. In addition, the accessible laterals entering the Pipes will be cleaned upgradient from their connection points with the Pipes, as feasible based on the cleaning techniques employed.

The proposed closure locations and limits of the Phase 1 cleaning are presented on Figure 2.

3.1.1 Performance Standards

As discussed in Section 1, the objectives of the cleanup are to:

1. Eliminate stormwater discharges from the Pipes to the LDW.
2. Remove the solids and associated contamination from the Pipes.

Contractor achievement of Objective 1 as part of Phase 1 work will be assessed by verifying that the Pipe closure points identified in Figure 2 have been plugged, thereby eliminating discharges to the LDW. Full blockage will be verified by inspection and photography of the closure points. Contractor achievement of Objective 2 as part of Phase 1 work will be assessed through a post-cleanup video reconnaissance survey to document that the visible solids and standing water within the cleaned portions of the Pipes are removed.

3.1.2 Pipe Closure

Objective 1 will be achieved through closure of the Pipes to eliminate discharge to the LDW. The method of closure will be based on discussions with the selected contractor, but the anticipated methods are either 1) plugging the Pipes with concrete or CDF, or 2) installing an expansion plug that is considered permanent and is shown to create a complete seal. The proposed closure locations, shown on Figure 2, are:

- Transition between the CMP and concrete portions of both Pipes
- Upgradient of SDMH 15B within the 15-inch Pipe angling onto Plant 2
- Downgradient pipe entrance to the 24-inch Pipe within the "Public" manhole located just east of the Jorgensen Property fence line
- Upgradient of SDMH-11 within the 15-inch lateral connection to the 24-inch Pipe
- Each manhole location providing access to the Pipes on the Jorgensen Property, excluding the "Public" manhole located just east of the Jorgensen Property fence line

Cleaning of the 12-inch lateral connecting to the 24-inch Pipe from the Jorgensen Property is impractical because the connection point cannot be accessed. As noted in Section 2.1.3, this lateral is plugged approximately 40 feet upgradient of the connection to the 24-inch Pipe and previous video reconnaissance by Boeing showed no solids accumulating in this small reach of the lateral. Therefore, cleaning will not affect achievement of the performance standards.

There is no structure at the transition between the CMP and concrete portions of the Pipes; therefore, in order to perform the temporary and final plugging at the transition point to CMP, soil will be excavated to expose the transition area. Sufficient excavation and shoring will be implemented as necessary to facilitate safe access to perform the closure (and potentially cleanout) activities. Tidal conditions will be considered when scheduling the excavation activity, because the entire length of the line on the Jorgensen Property exists within the tidal flushing elevations.

3.1.3 Pipe and Lateral Cleaning

3.1.3.1 Pipe Jetting

Objective 2 will be achieved by removing solids and associated chemicals within the Pipes and laterals between the closure locations shown on Figure 2. The method of cleanout will be based on discussions with the selected contractor, but the anticipated method is washing the Pipes and associated accessible laterals.

Jet washing, which has been employed previously to clean stormwater drainages at the Plant 2 Facility and Jorgensen Property, involves a jetting nozzle with five jets, with four angled backwards and one facing forward. The jetting nozzle is attached to a high-pressure rubber hose connected to a pressurized vessel on a truck. The jetting nozzle is self-propelled by the backwards-directed water jets. The jetting will loosen solids from the entire pipe diameter, with an emphasis on the base of the pipes where the bulk of the solids occur. The jet washing activities will be conducted through sequential plugging of the pipe as described below so that no wash water or solids will discharge to the LDW.

Previous video reconnaissance conducted by Boeing as part of the *Phase 2 Transformer Investigation Work Plan* (Floyd | Snider and Weston Solutions 2004) identified solids accumulations below the Pipe manhole locations identified on Figure 2. It is anticipated that the base of each manhole will be cleaned by pumping out these solids and any accumulated water, followed by pressure washing[4] and vacuuming of loosened solids and accumulated wash waters through the remainder of the Pipes and laterals. Beginning at the most upgradient manhole, the solids within each horizontal pipe segment will be flushed by high-pressure water jetting and vacuumed at the nearest downgradient manhole, which will be blocked to allow accumulation of wash water and solids. It is anticipated that a technician stationed in the manhole will direct the jetting hose forward into the downgradient pipe segment approximately half the distance to the next manhole. The hose will then be withdrawn to re-clean the Pipe and/or lateral in the opposite direction. As this is done, wash water and solids are vacuumed from the downgradient and upgradient manholes. The

4 If necessary, a technician (using confined-space safety protocols) will enter each manhole to effectively dislodge accumulated solids.

technician will move to the next downstream manhole and then clean the downgradient and upgradient segments to the halfway points, and so on.

The 15-inch lateral leading to Plant 2 will be cleaned to the point of abandonment in a similar manner, as this lateral can be accessed from Manhole 37-7. As discussed in Section 3.1.2, because the 12-inch lateral connection to the 24-inch Pipe is not accessible, this limited 40 feet of lateral will not be cleaned.

A video survey will be performed following the cleaning to verify that solids and wash waters have been removed. Cleaning will be repeated as necessary until the Pipes and accessible laterals are visibly free of solids. Waters and solids will be managed for waste characterization and disposition, as described in the next subsection..

3.1.3.2 Water/Solids Collection, Treatment and Disposal

Water and solids generated by the cleaning of catch basins will be vacuumed together as they are generated and as they accumulate by gravity at successive temporarily-plugged downgradient manholes. Regardless of the cleanout and closure sequencing, the wash water and liberated solids generated from the cleaning will be captured to prevent discharge to the LDW. As discussed in Section 3.1.2, there is no manhole at the transition between the CMP and concrete portions of the Pipes, so soil is expected to be excavated to expose the transition area to allow cleaning of the most downgradient sections of the concrete portions of the Pipes. Alternative methods proposed by potential contractors during the bid process will be considered and employed if effective in meeting the objectives of the work..

Solids and waters will be accumulated in a vacuum truck and the waters segregated either for onsite treatment and permitted sanitary discharge or for off-site treatment and disposal by a licensed treatment/storage/disposal facility. Solids will be dewatered and stabilized and drummed and sent off site for disposal/treatment at the proper permitted facility. Disposal of the water and solids may entail limited profile sampling to facilitate permitted sanitary discharge or waste determinations.

3.2 Phase 2 – Corrugated Metal Pipe and Bank Portion

Phase 2, which will address the CMP and bank portion of the Pipes, will be prepared and submitted subsequent to completion of Phase 1 work and completion report. This schedule will allow time to complete additional characterization of bank soils surrounding the CMP portion of the Pipes. It will also allow any necessary coordination of the work into the Boeing Resource Conservation and Recovery Act (RCRA) Order and the Earle M. Jorgensen (EMJ)/Jorgensen Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Order actions and processes.

3.2.1 Proposed Phase 2 Data Gaps Characterization

To facilitate planning for the CMP and bank excavation, a field investigation will be proposed in a separate work plan as part of Phase 2. This investigation will serve to characterize soil conditions and quality at and adjacent to the CMP portion of the Pipes and document to what extent bank soils have been impacted by PCBs associated with the CMP. This information will be used to design the soil excavation necessary to remove elevated soil concentrations as part of the CMP removal. A work plan to perform this investigation will be provided to EPA, per the schedule in Table 3.

3.2.2 CMP Removal and Soil Cleanup

Details of the removal of the CMP portion of the Pipes and any concomitant soil cleanup and bank restoration will be submitted in separate work plans for review and approval by EPA's Emergency Response Office, following the evaluation of data collected (Section 3.2.1).

3.2.3 Integration with 2012 RCRA and CERCLA Remedies

Because the Boeing RCRA and EMJ/Jorgensen CERCLA sediment remediation activities are currently scheduled for late 2012, potential sources of elevated chemical concentrations need to be controlled prior to this date. The Phase 1 closure and cleanout activities will be conducted well ahead of this schedule, and the Phase 2 activities will be conducted concurrent with the sediment remediation activities to avoid the potential for recontamination associated with the CMP portion of the Pipes (see Section 5).

4 COMPLETION REPORTING

4.1 Phase 1

Following EPA's approval and implementation of this Phase 1 Work Plan, a completion report for Phase 1 will be submitted to EPA to detail, at a minimum, the following actions:

- Methods used to close the upgradient and downgradient locations of the Pipes and and documentation of successful closure
- Pipe cleaning process and documentation that the cleaning performance objective was achieved
- Collection, treatment, and disposal of solid and rinsate materials, including any analyses performed for disposal purposes

Field documentation will consist of photographing each manhole location, condition of Pipe beneath each manhole prior to cleaning (for example, the depth of water and odor of solids and debris), line segment cleaned, start and stop times, the volume of water and approximate quantity of solids removed, volume of concrete plug, and other activities. Photographs of the manholes and Pipes' ends will be taken upon completion, and a DVD of the final video survey will be provided.

4.2 Phase 2

The details of a completion report for Phase 2 will be provided to EPA's Emergency Response Office later, when the work plan for Phase 2 is completed.

5 SCHEDULE

The proposed implementation schedule for Phase 1 work is detailed in Table 3. Phase 2 actions will be addressed in subsequent documents.

As shown in Table 3, closure of the Pipes will be conducted this summer but the exact timing for implementation of the Pipe and lateral cleanouts will be dependent on the following factors:

- Confirmation that the City has eliminated its discharges to the 24-inch Pipe
- Receipt of an approval permit from King County to discharge the collected wash water to the King County system under a Waste Discharge Permit (if the rinsate meets the Permit criteria)
- Receipt of approval from the City to access the "Public" SDMH in order to close the downgradient entrance to the 24-inch Pipe
- Contractor availability
- Tidal schedule allowing safe working conditions during daylight hours
- Regional rainfall conditions

Because of the uncertainty inherent in these factors, Boeing and Jorgensen will make best efforts to complete the cleanout as soon as possible to achieve Objective 2.

Table 3

Implementation Schedule

	Task	Due Date
1.	Draft Work Plan Submitted to EPA	July 16, 2010
2.	EPA Approval	Mid-August 2010 – estimated
3.	Vendor Solicitation and Contracting	August-September 2010
4.	Phase I Pipe Closure	Mid-September 2010
5.	Phase 1 Pipe and Lateral Cleanouts	Anticipated by end of 2010 - timeline based on Section 5 factors
6.	Completion of Phase I Field Activities	30 days after field activities begin; dependent on weather conditions and tidal state for conducting video survey
7.	Draft Phase 1 Report to EPA	90 days after completion of field activities
8.	Phase 2 Investigation Work Plan Submitted	1st Quarter 2011
9.	Phase 2 Investigation Completed; Report and Phase 2 CMP/Bank Excavation Work Plan Submitted to EPA	3rd Quarter 2011
10.	Phase 2 CMP-Bank Excavation and Completion Report Submittal	2nd Quarter 2012

6 REFERENCES

Farallon Consulting, LLC (Farallon), 2005. "Storm Drain Line Data Summary, Jorgensen Forge Corporation." Technical Memorandum. July 28, 2005.

Floyd Snider McCarthy, Inc., 2004. Phase 1 Transformer PCB Investigation Report. Prepared for The Boeing Company. February 24, 2004.

Floyd | Snider and Weston Solutions, Inc., 2004. Phase 2 Transformer PCB Investigation Work Plan. Prepared for The Boeing Company. November.

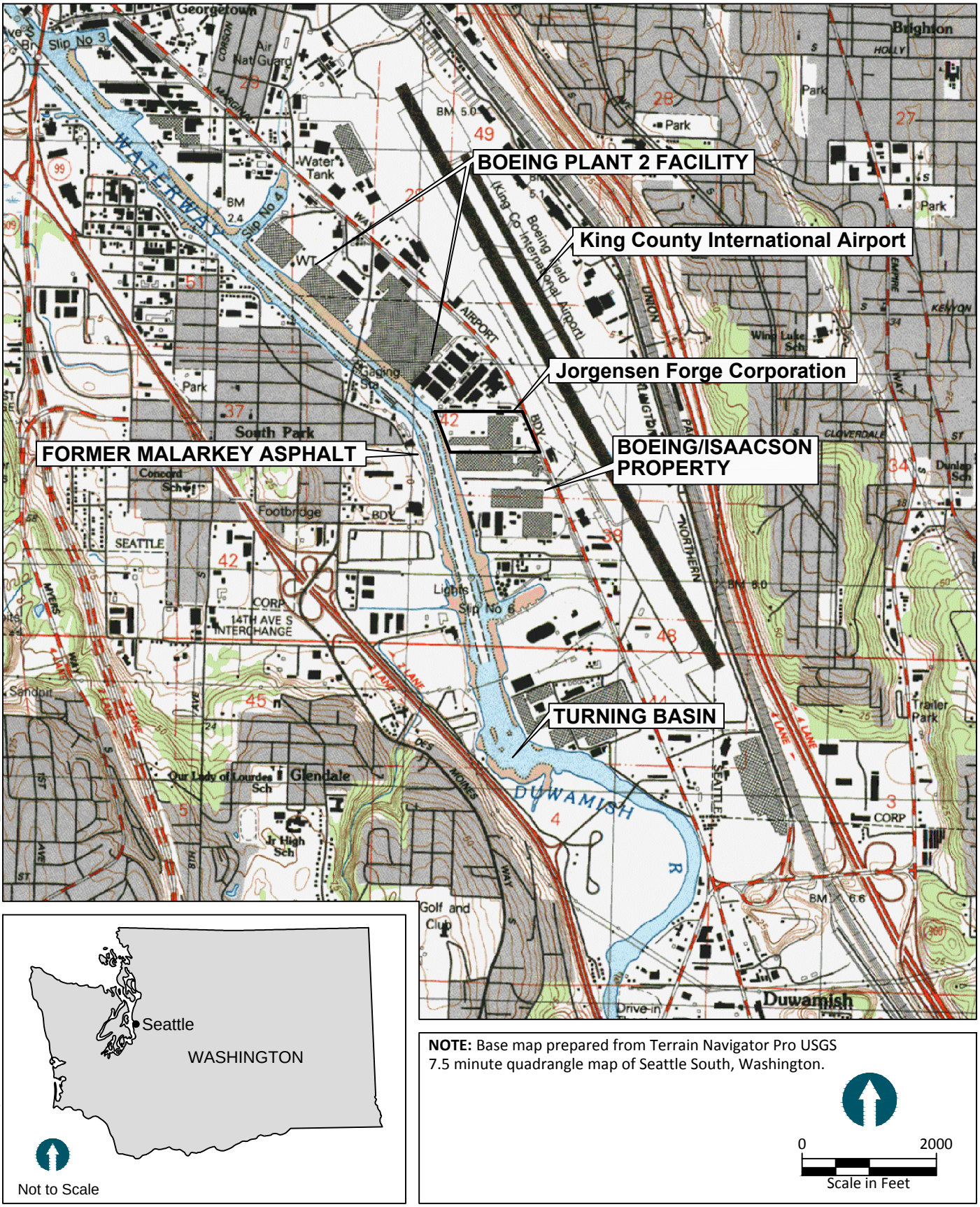
Floyd | Snider and Weston Solutions, Inc., 2005. Phase 2 Transformer PCB Investigation Report. Prepared for The Boeing Company. August 3, 2005.

King County and City of Tukwila, 2008. Letter to Ecology Regarding Notice of Violation (NOV) No. 6180. December 12, 2008.

PBS Engineering and Environmental (PBS), 2008. PCB Source Investigation of the City of Tukwila Stormwater System. Prepared for the City of Tukwila. October 2008.

Washington State Department of Ecology (Ecology), 2008. Notice of Violation No. 6180. November 13, 2008.

FIGURES

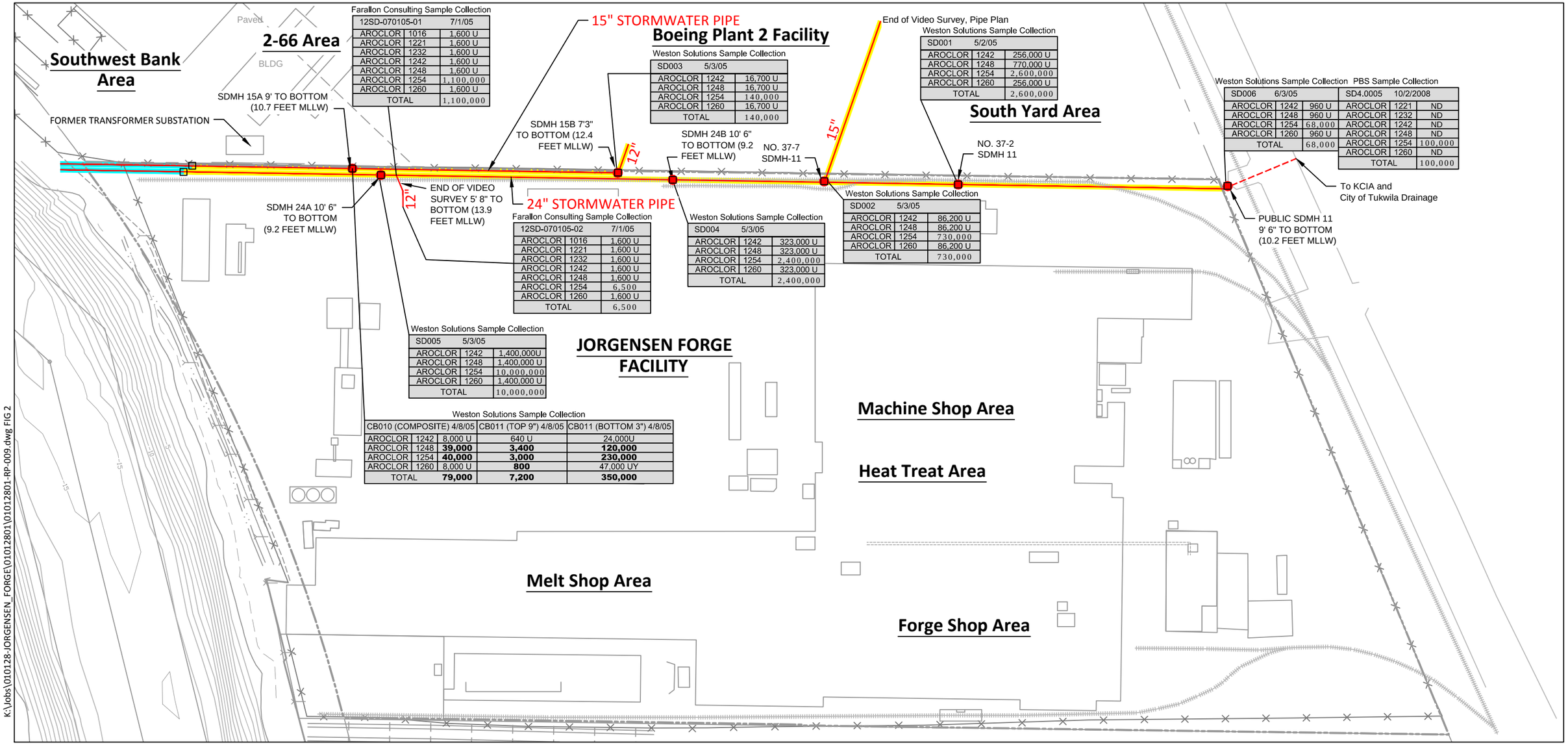


K:\Jobs\010128-JORGENSEN_FORGE\01012801\01012801-RP-004.dwg FIG 1 WP (2)

Jul 15, 2010 4:12pm cdavidson

Figure 1
Site Vicinity Map
Property Line Pipes Cleanout Work Plan
8531 East Marginal Way South, Seattle, Washington

ANCHOR QEA



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Jul 15, 2010 4:14pm cdavidson

LEGEND:

- Phase 1
- Phase 2
- SDMH 24B — Manhole Location
- 10' 6" TO BOTTOM — Feet to Bottom of Manhole
- Proposed Pipe Closure Location
- (11.2 FEET MLLW) — Elevation of base of Manhole in Mean Lower Low Water Datum
- Property Boundary
- Railroad Spur
- Fence

BOLD Indicates Concentrations Above The Sediment Management Standards 2 Lowest Apparent Threshold Screening Level

U No Detectable Concentrations Above the Listed Laboratory Reporting Limit

ND Not Detected

SOURCE: Prepared from drawing provided by Farallon Consulting dated April 15, 2008.

HORIZONTAL DATUM: Washington State Plane North, NAD83.

NOTE: All results in micrograms per kilogram (ug/kg).

0 120
Scale in Feet

ANCHOR QEA

Figure 2
Property Line Pipes PCB Analytical Results
Property Line Storm Pipes Cleanout Work Plan
8531 East Marginal Way South, Seattle, Washington

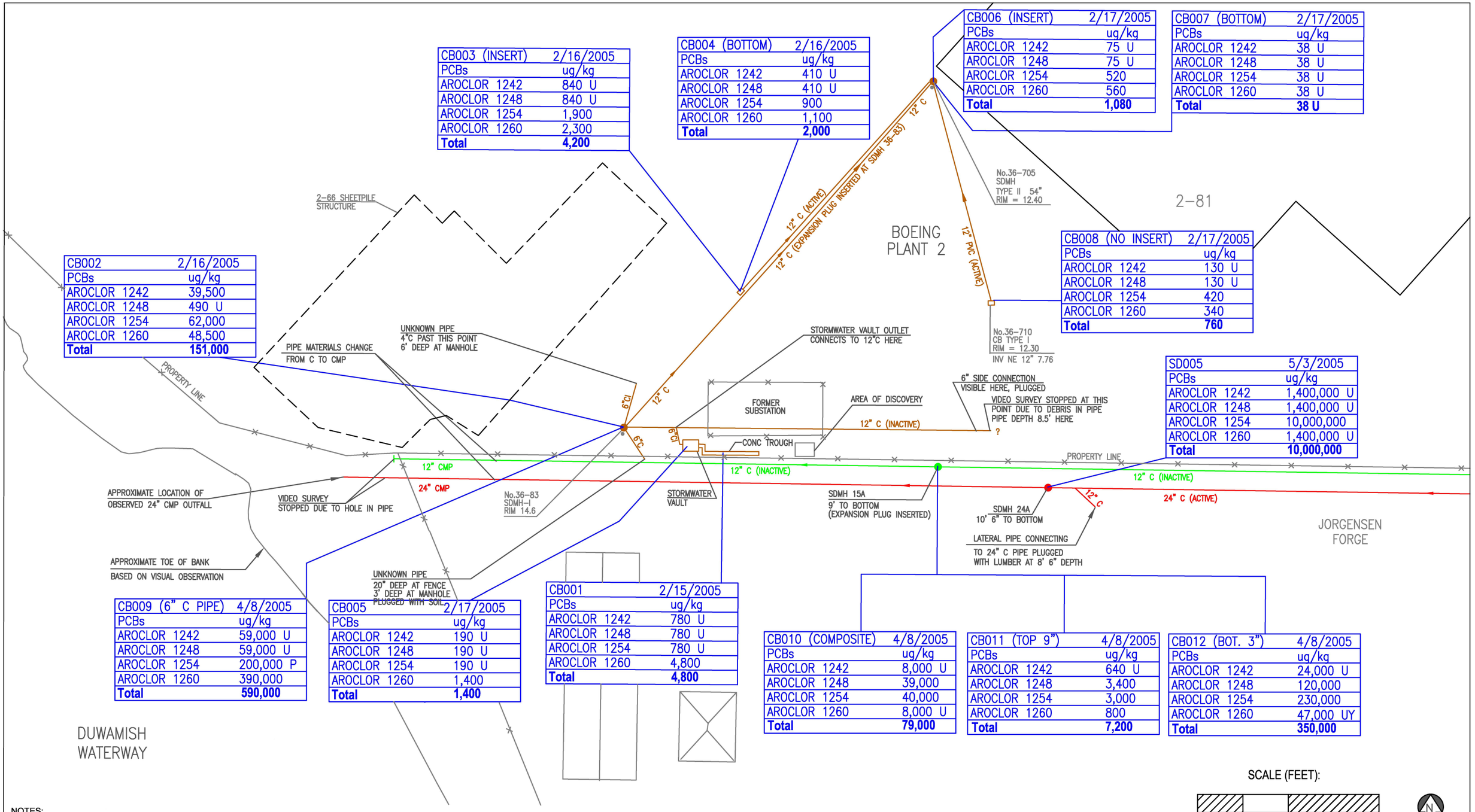
APPENDIX A
REFERENCE FIGURES AND TABLES

Floyd Snider McCarthy, Inc.
Strategy & Technical Solutions for Contaminated Properties

BOEING

Phase 1 Transformer PCB Investigation Report
Boeing Plant 2
Seattle, Washington

Photo A.1
Photo Taken on 12/13/01 Showing Area of
Discovery Excavation Looking Towards River



NOTES:
1) PIPES SHOWN IN COLOR WERE INVESTIGATED USING A VIDEO CAMERA OR SNAKE/SONDE EQUIPMENT.

NO.	DATE	APPR.	REVISION

PHASE II TRANSFORMER PCB INVESTIGATION
BOEING PLANT 2
SEATTLE, WASHINGTON

WESTON SOLUTIONS — SEATTLE WASHINGTON

CHECKED	
DES. ENG.	
PROJ. ENG.	
PROJ. MGR.	
APPROVED	
APPROVED	
DATE	

EXPLANATION OF DRAWING SYMBOLS

CHAIN LINK FENCE	CB001 SAMPLE IDENTIFER
MANHOLE (COLOR VARIES)	2/15/2005 SAMPLE DATE
C CONCRETE	
CMP CORRUGATED METAL PIPE	
PVC POLY VINYL CHLORIDE	
CI CAST IRON	
STORMWATER FLOW DIRECTION	
U NOT DETECTED ABOVE GIVEN DETECTION LIMIT	
Y DETECTION LIMIT ELEVATED DUE TO INTERFERENCES	
P POSITIVELY IDENTIFIED BUT WITH RPD > 40%	

FIGURE 3.7
STORM SURVEY DETAILS AND PCB AROCLOR CONCENTRATIONS IN STORM SYSTEM SOLIDS SAMPLES

DRAWN DLD	DATE JULY 29, 2005	DWG. NO. BP2-TPB	REV. NO. 0
SCALE 1" = 40'	W.O. NO. 03709-079-001-0004 RFW NO. 05-0098	SHT. 1 OF 1	

Table F.1
Storm Solids Sampling Results for Metals

Location	Sample ID	Location Description	Sample Date	Metals (mg/kg)															
				Arsenic		Barium		Cadmium		Chromium		Lead		Mercury		Selenium		Silver	
				Value	Q	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
CB010	P2ST-GR-CB010-0000	MH 15A along 12" storm pipe on JF: composite sample from top and bottom layers.	4/8/2005	0.2	U	0.38		0.01		0.02	U	0.2		0.0001	U	0.2	U	0.02	U
CB011	P2ST-GR-CB011-0000	MH 15A along 12" storm pipe on JF: sample from top 9" layer of slag/gravel atop sand layer at base of manhole.	4/8/2005	30	U	42		1	U	387		100		0.23		30	U	2	U
CB012	P2ST-GR-CB012-0000	MH 15A along 12" storm pipe on JF: sample from 3" sand layer at base of manhole.	4/8/2005	20		132		3.7		133		477		0.6		20	U	1	U

Notes:

U Indicates the compound was undetected at the reported concentration.

Table F.2
Storm Solids Sampling Results for SVOCs

Location	Sample ID	Location Description	Sample Date	Interval (inches below pile)		Semi-Volatile Organic Carbons (µg/kg)																			
						Benzo(a)anthracene		Benzo(a)pyrene		Benzo(b)fluoranthene		Benzo(k)fluoranthene		Chrysene		Dibenz(a,h)anthracene		Fluoranthene		Fluorene		Indeno(1,2,3-cd)pyrene		Naphthalene		Pyrene	
				Upper Limit	Lower Limit	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q	Value	Q
CB009	P2ST-GR-CB009-0000	6-inch pipe into MH 36-83.	4/8/2005	0	1	280	U	280	U	280	U	280	U	280	U	280	U	280	U	280	U	280	U	280	U	280	U
CB010	P2ST-GR-CB010-0000	MH 15A along 12" storm pipe on JF: composite sample from top and bottom layers.	4/8/2005	0	12	64	U	64	U	64	U	64	U	64	U	64	U	64	U	64	U	64	U	64	U	64	U
CB011	P2ST-GR-CB011-0000	MH 15A along 12" storm pipe on JF: sample from top 9" layer of slag/gravel atop sand layer at base of manhole.	4/8/2005	0	9	64	U	64	U	64	U	64	U	64	U	64	U	64	U	64	U	64	U	64	U	64	U
CB012	P2ST-GR-CB012-0000	MH 15A along 12" storm pipe on JF: sample from 3" sand layer at base of manhole.	4/8/2005	9	12	130		98		95		130		160		66	U	250		66	U	92		66	U	230	

Notes:

U Indicates the compound was undetected at the reported concentration.

MH Manhole.